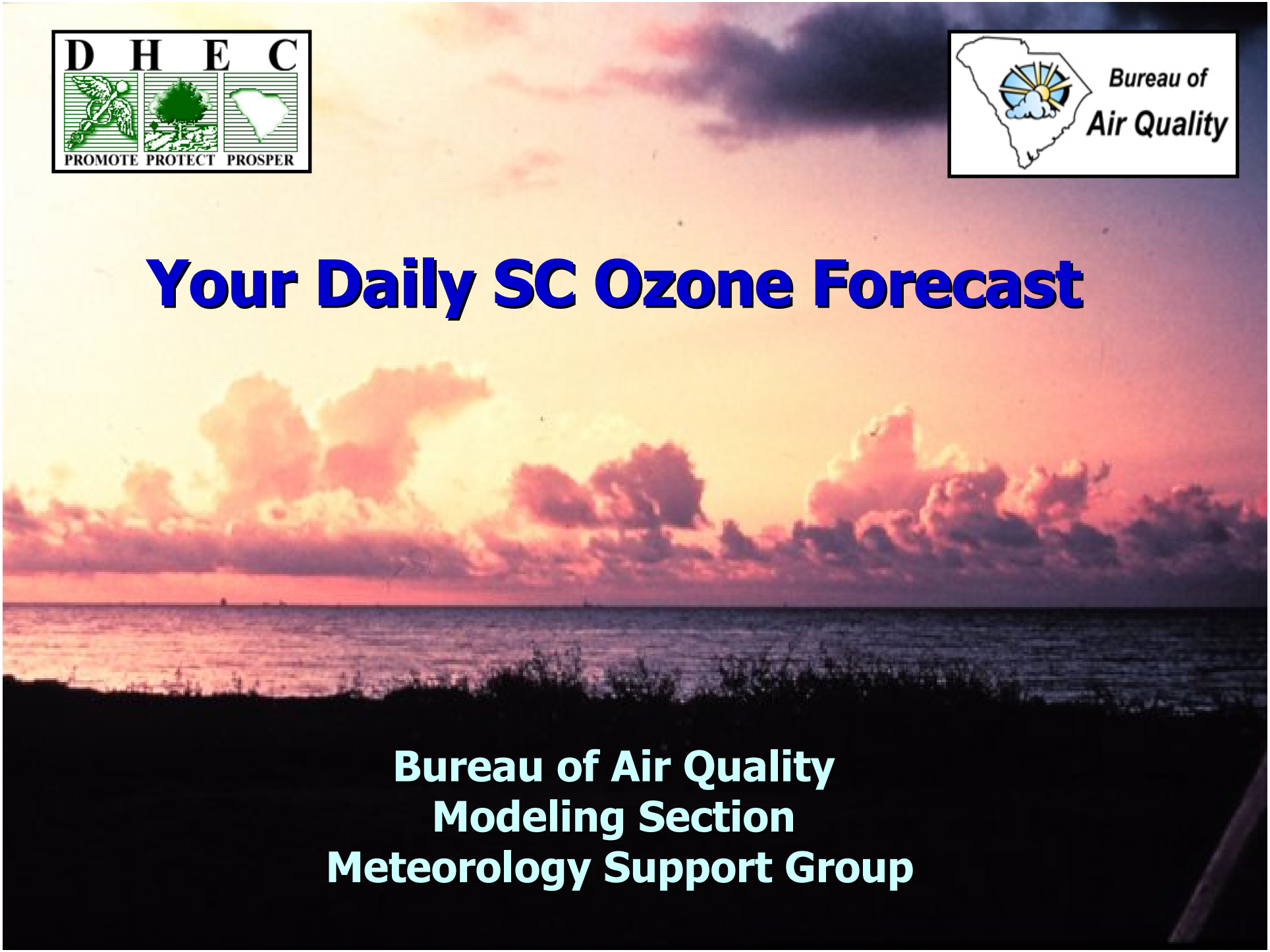
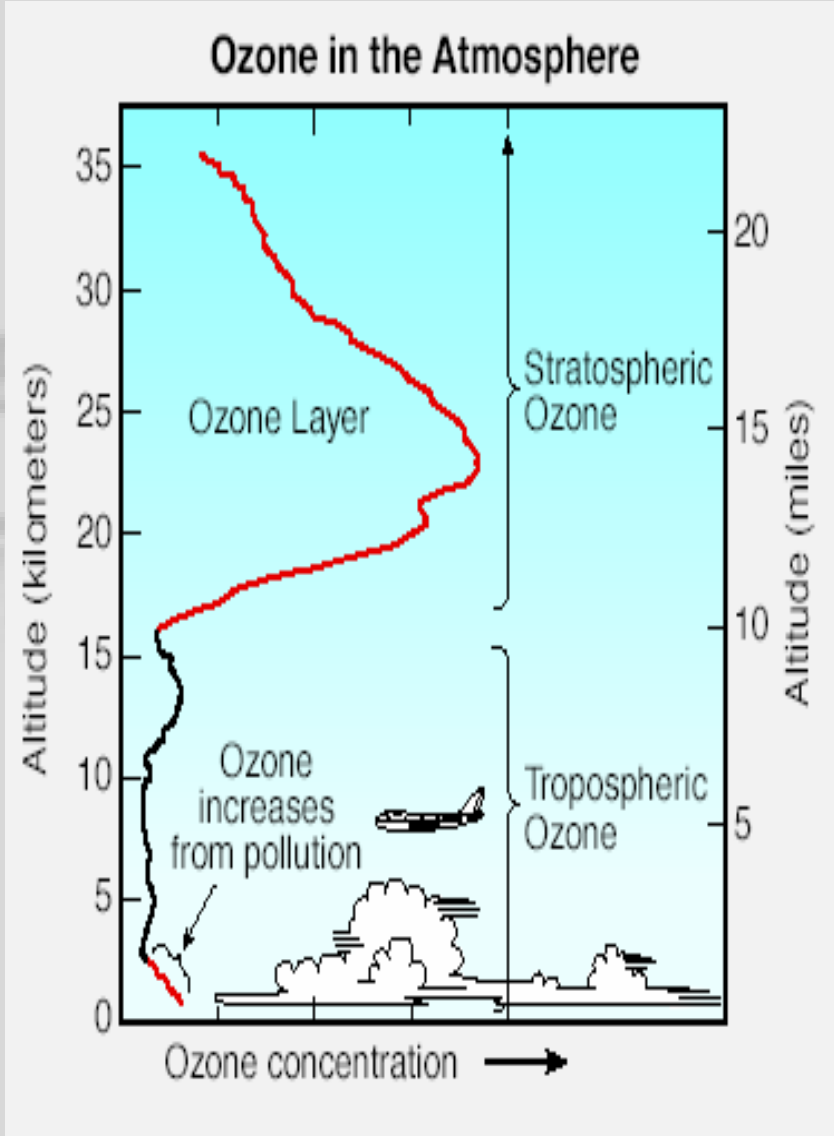

D H E C
PROMOTE PROTECT PROSPER
Bureau of
Air Quality
Your Daily SC Ozone Forecast
Bureau of Air Quality
Modeling Section
Meteorology Support Group

What is Ground-level Ozone?

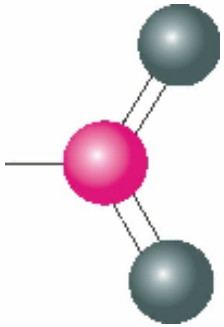
Ozone in the Atmosphere

- **"Ozone Layer"**
  - Stratospheric ozone.
  - Formed by O_2 and sunlight
  - Thin & transparent
  - Protects life from harmful UV rays.
- **"Ground-level Ozone"**
  - Tropospheric ozone.
  - Formed primarily from man-made emissions & sunlight
  - Primary component in photochemical smog
  - Harmful to life
- **"Good Up High, Bad Nearby."**



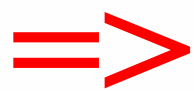
Formation of Ground-level Ozone

Oxides of Nitrogen (NOx)

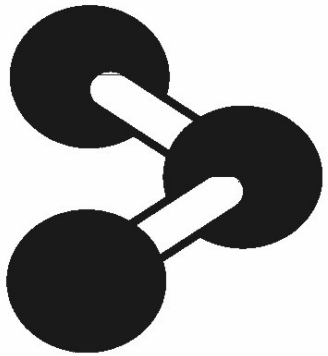


- AND -

Volatile Organic Compounds (VOCs)



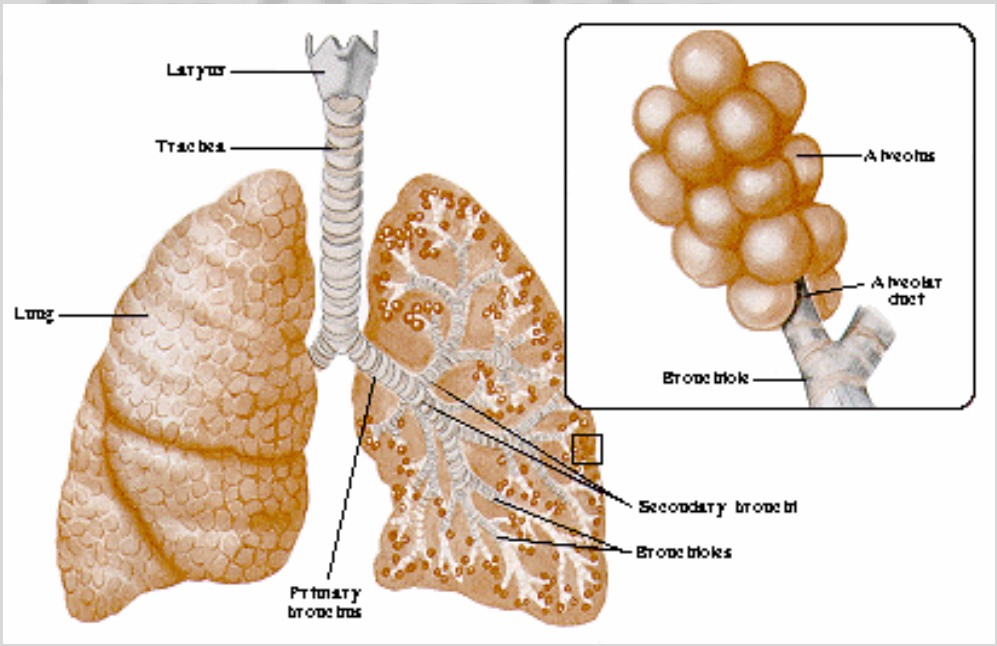
Strong Spring or Summer Sun
(with low RH & light winds)



Ozone (O_3)

Health Risks Associated With Ground-level Ozone

- Inflames lung & respiratory tissues.
- Impairs the body's immune system.
- Irritates the eyes.



Why do we forecast Ground-level Ozone ?

1) PROTECT PUBLIC HEALTH

- High concentrations of ground-level ozone are hazardous to human health.

2) Possible attainment issues

- EPA Standard: 8-hr average peak of 85 ppb (101 AQI) lowered to 75 ppb in March 2008.

3) Because we can!

- Ozone patterns follow Weather patterns.

Actions to Reduce Ground-level Ozone

- Carpool / Ride-share.
- Shop by phone, mail, or the Internet.
- Telecommute or work alternative schedule.
- Properly maintain your vehicle.
- Refuel after 6 pm, and don't top-off the tank.
- Mow lawn after 6 pm as well.
- Accelerate gradually.

How are Ground Level Ozone Forecasts Produced ?

BASIC SCHEME:

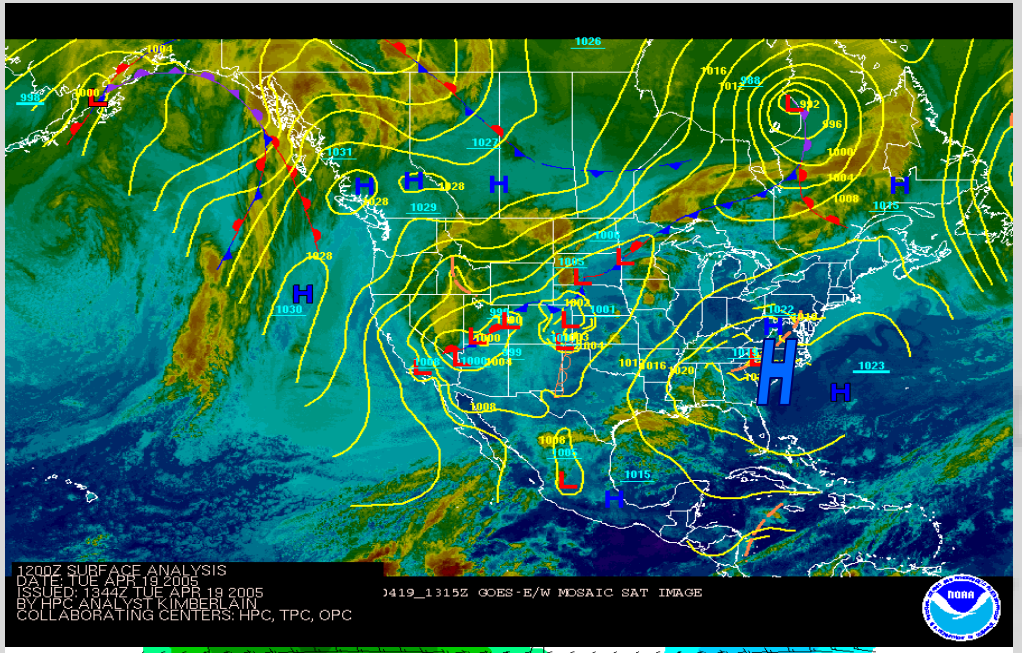
1. **ANALYZE** Today's Meteorology
   - effect on current ozone
2. **FORECAST** Tomorrow's Meteorology
   - change in met. → change in ozone
3. **ISSUE** OZONE Forecast
   - color-coded AQI

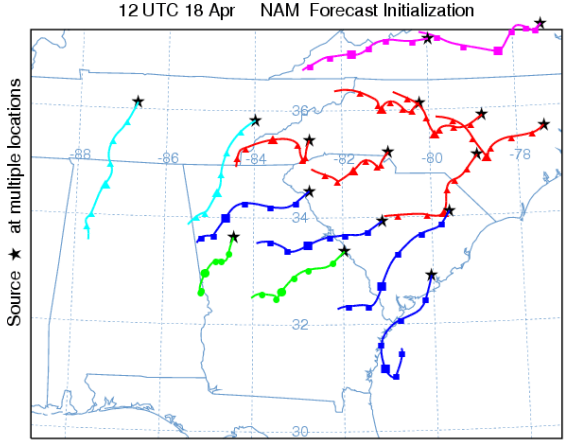
Forecasting Tools

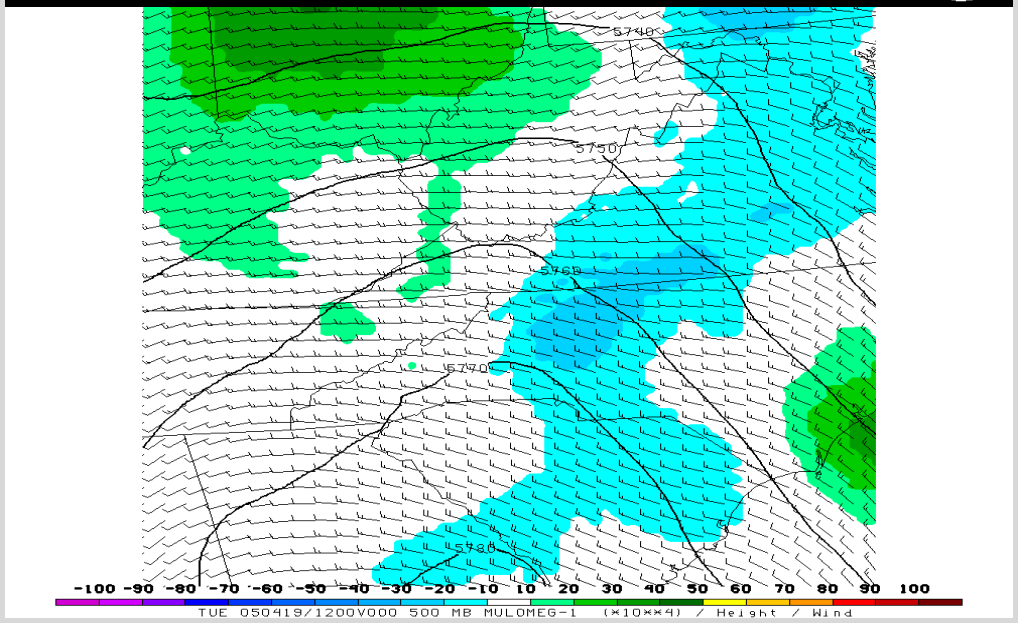
- **Meteorology (many internet sources)**
  - Current meteorological conditions
  - Surface / Upper-air / Atmospheric profiles
  - Satellite / Radar
  - Government forecast model output / interpret
  - Climatological data
- **Ambient Ozone Monitoring**
  - SC, GA and NC

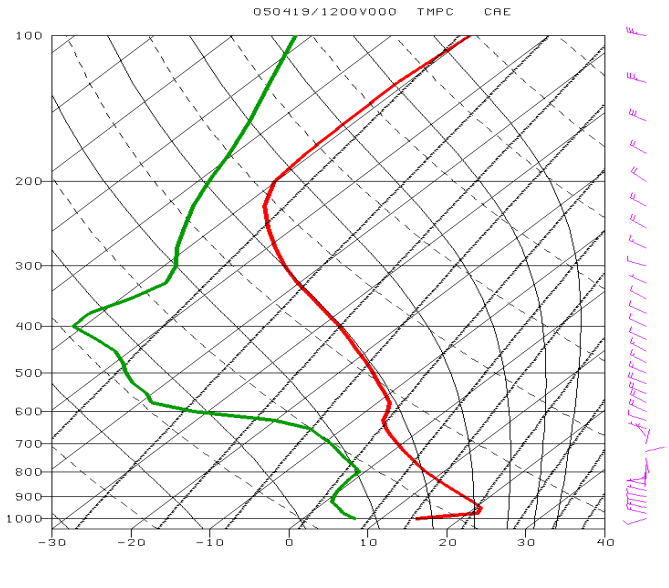



Example Weather Data

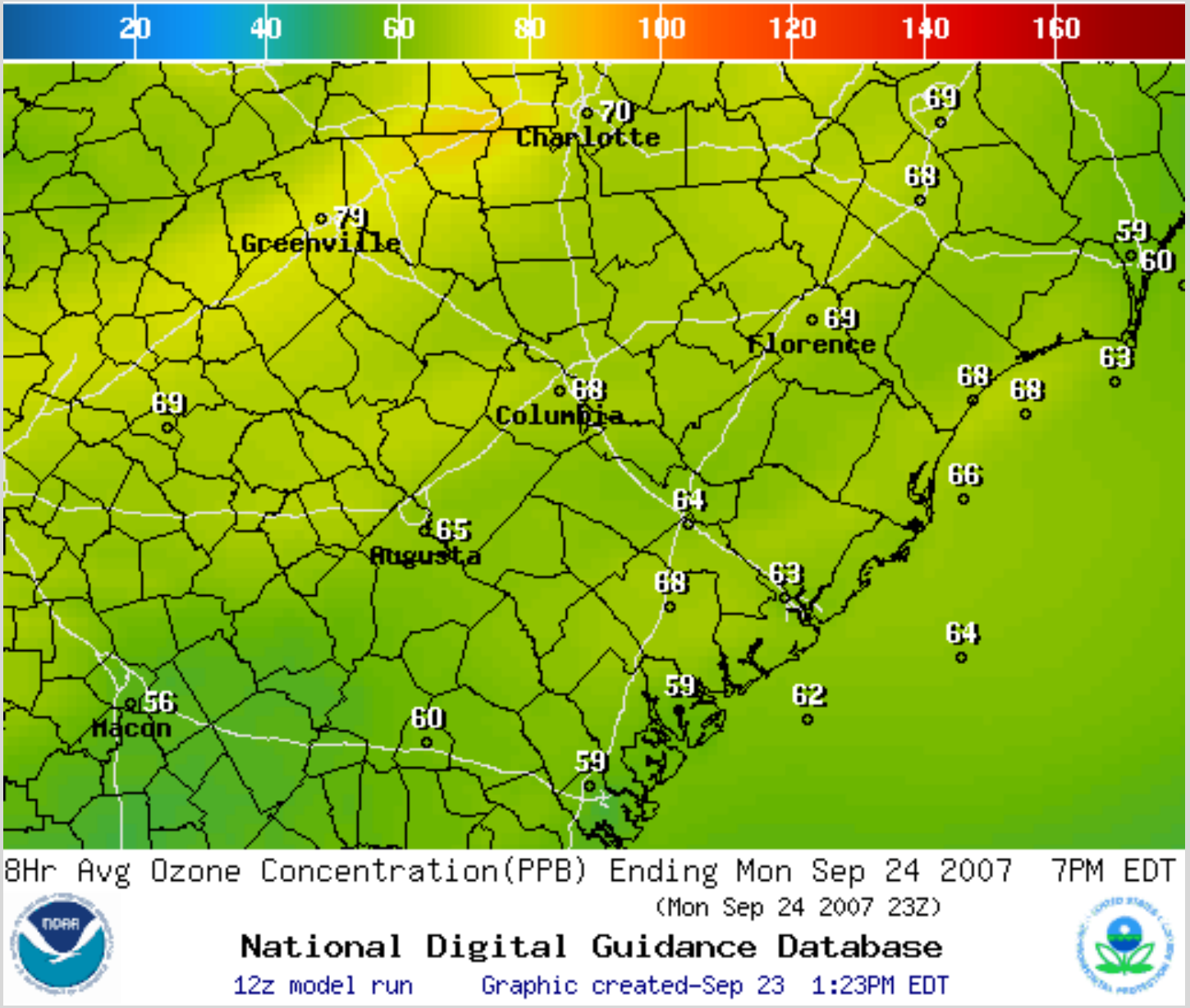


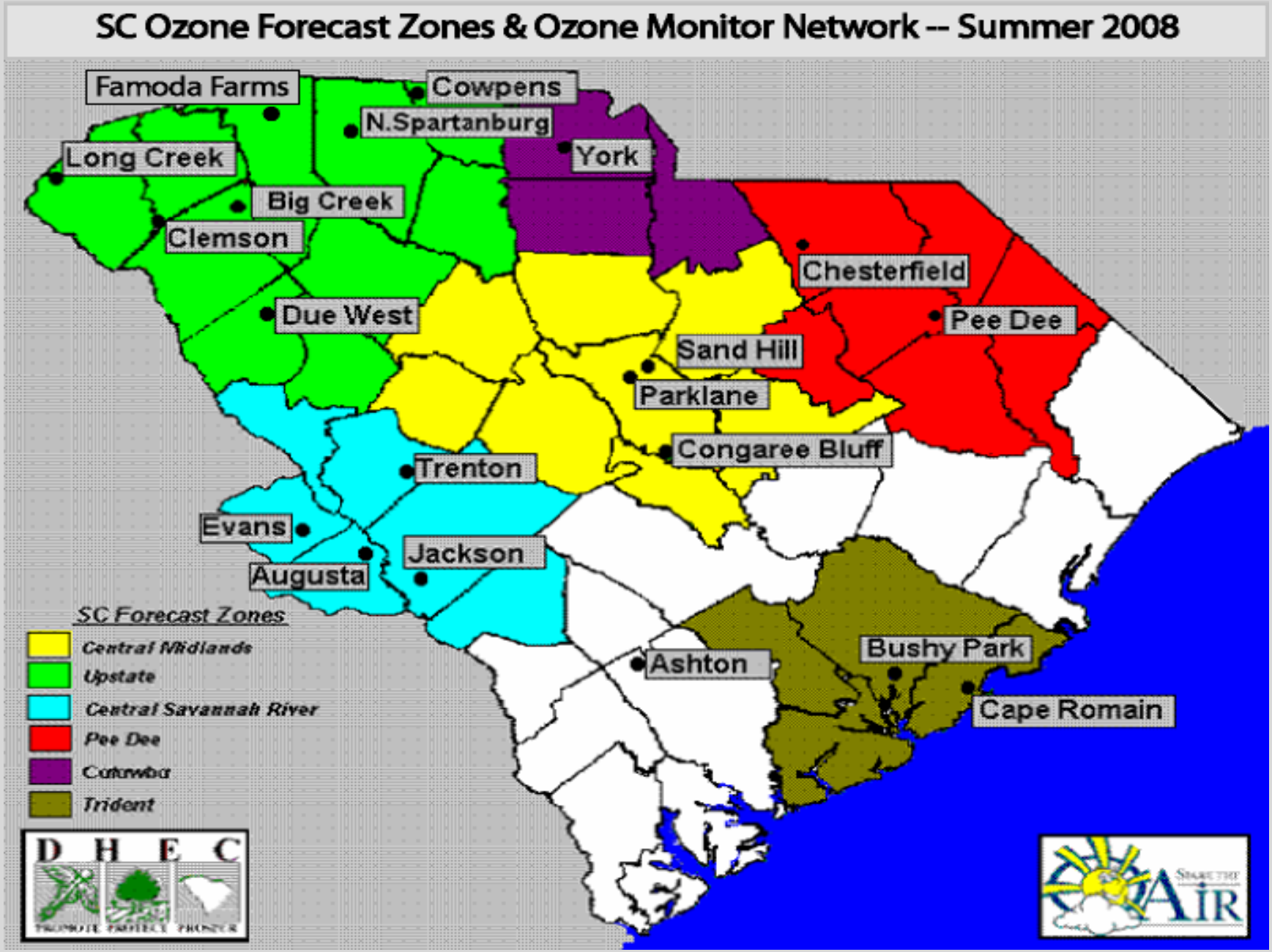






AIR QUALITY FORECAST GUIDANCE




SC Ozone Forecast Zones & Ozone Monitor Network -- Summer 2008
Famoda Farms
Cowpens
N.Spartanburg
Long Creek
York
Big Creek
Clemson
Chesterfield
Due West
Pee Dee
Sand Hill
Parklane
Congaree Bluff
Trenton
Evans
Jackson
Augusta
Ashton
Bushy Park
Cape Romain
SC Forecast Zones
Central Midlands
Upstate
Central Savannah River
Pee Dee
Catawba
Trident
D H E C
AIR

Ozone Predictor Variables
▶Meteorological

Element	For High Ozone *
Pressure (High/Low)	High
Vertical "Stability"	"Stable"
Surface Temperature	**Hot**
Atmospheric Moisture	**Dry**
Wind Speed	**Calm**
Wind Direction (from, if not calm)	W, SW, NE
Cloud Cover	Clear / Pt. Cloudy
Soil Moisture	Dry
Recirculation of Precursor Pollutants	Recirculation

* general trends

Ozone Predictor Variables

▸Non-Meteorological

Element	For High Ozone *
Yesterday's Ozone	High
Today's Ozone	High
Sun Angle	High
Day of Week	Wed, Thu, Fri
Terrain	case dependent

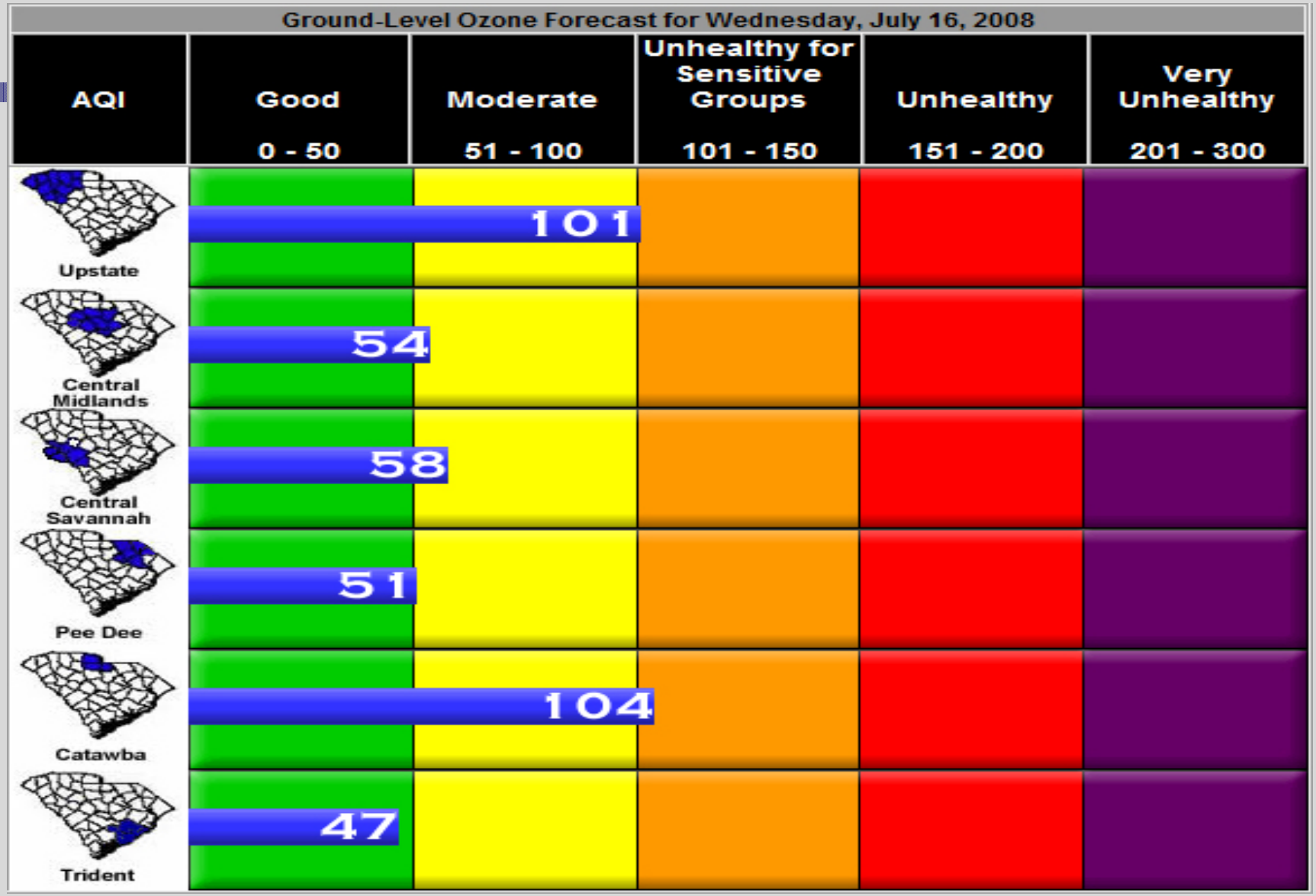
* general trends

EPA's Air Quality Index Chart

AIR QUALITY INDEX		
Index Values	Descriptors	Cautionary Statements for Ozone
0 to 50	Good	None.
51 to 100	Moderate	Unusually sensitive people should consider limiting prolonged outdoor exertion.
101 to 150	Unhealthy for Sensitive Groups	Active children and adults, and people with respiratory disease, such as asthma, should limit prolonged outdoor exertion.
151 to 200	Unhealthy	Active children and adults, and people with respiratory disease, such as asthma, should avoid prolonged outdoor exertion; everyone else, especially children, should limit prolonged outdoor exertion.
201 to 300	Very Unhealthy	Active children and adults, and people with respiratory disease, such as asthma, should avoid all outdoor exertion; everyone else, especially children, should limit outdoor exertion.

"Spare the Air" Forecast

http://www.dhec.sc.gov/ozone



Forecast Distribution

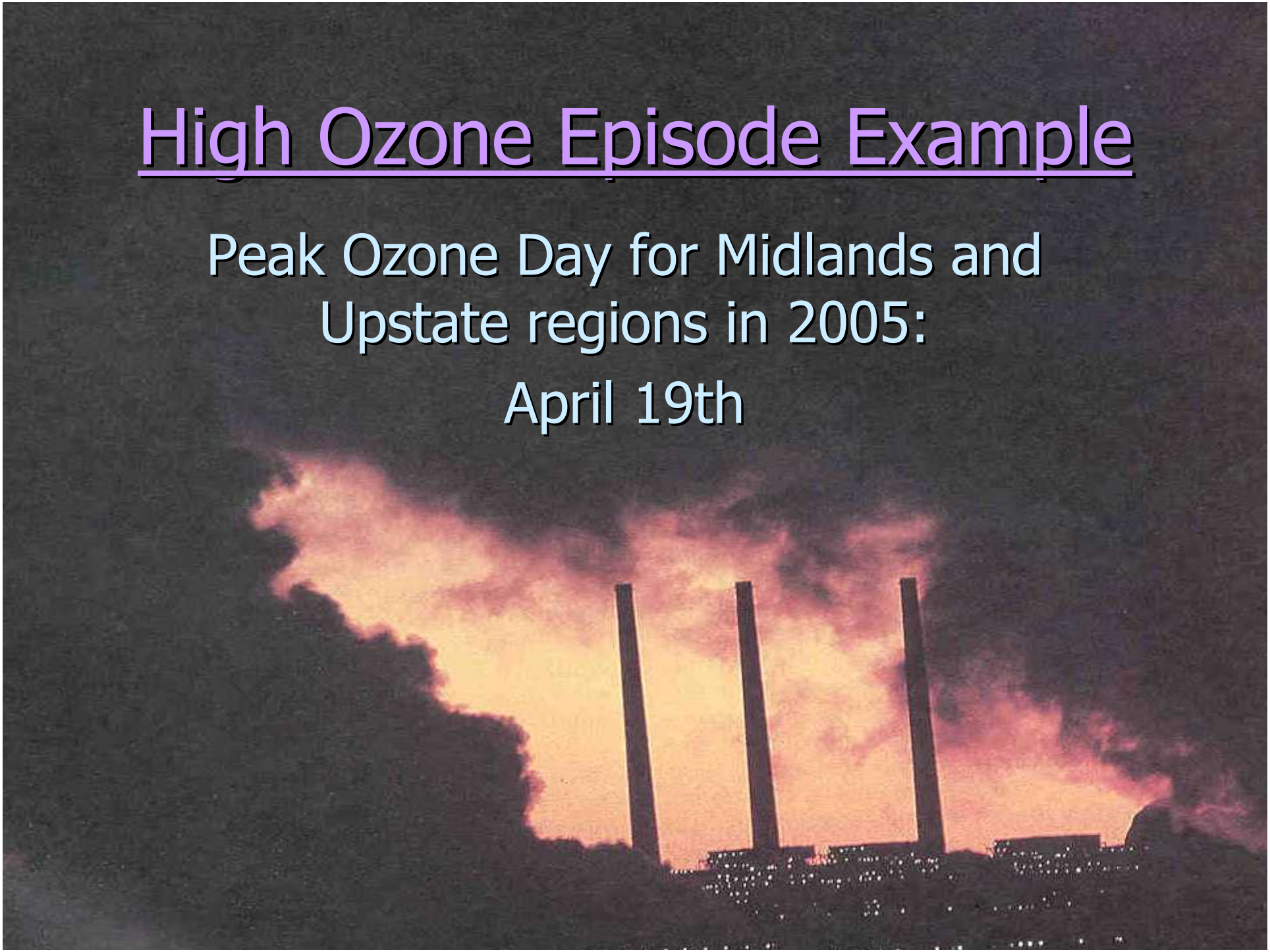
Issued by 3:30PM daily, March 31 - Sept. 29

- Ozone Web page www.scdhec.gov/ozone
- EPA AIRNOW Webpage
- Direct E-mail (EPA's "EnviroFlash")
- Ozone Hotline 898-4094 (Columbia) or 1-866-238-4973
- Redistributed by:
  - National Weather Service
  - TV, Radio & Print Media
  - The Weather Channel

High Ozone Episode Example

Peak Ozone Day for Midlands and Upstate regions in 2005:

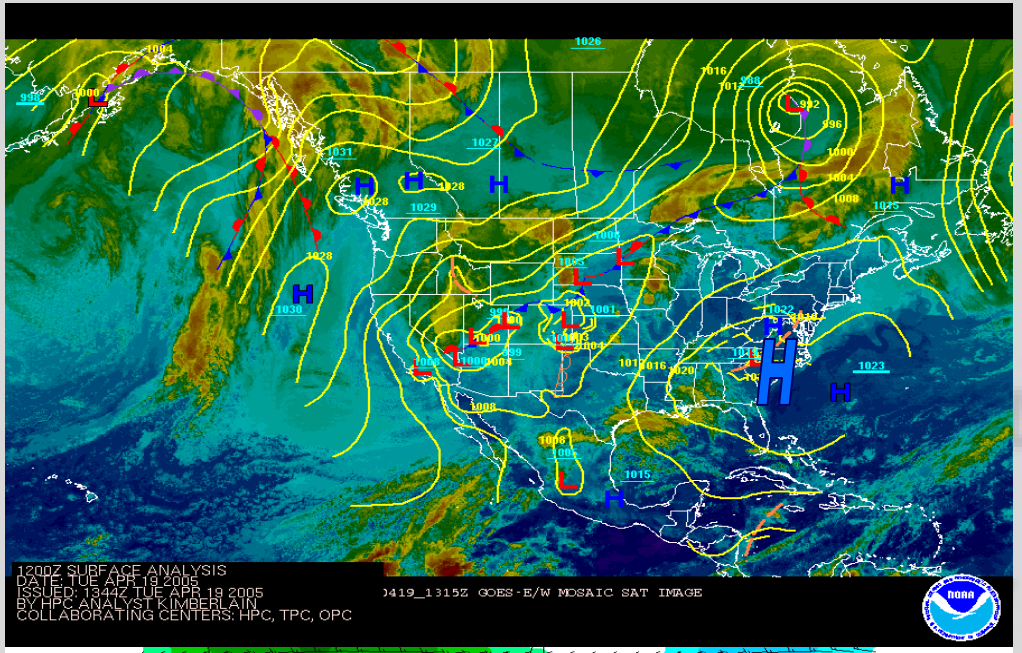
April 19th

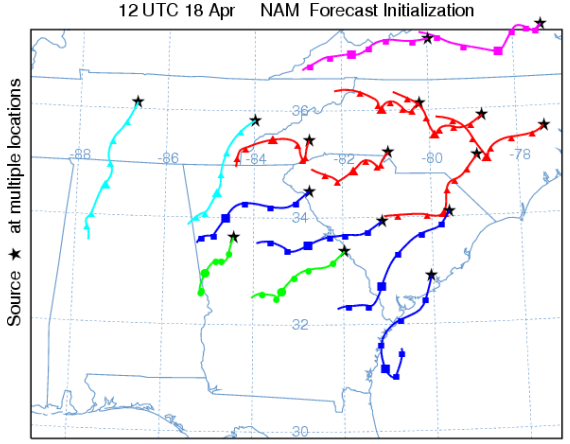


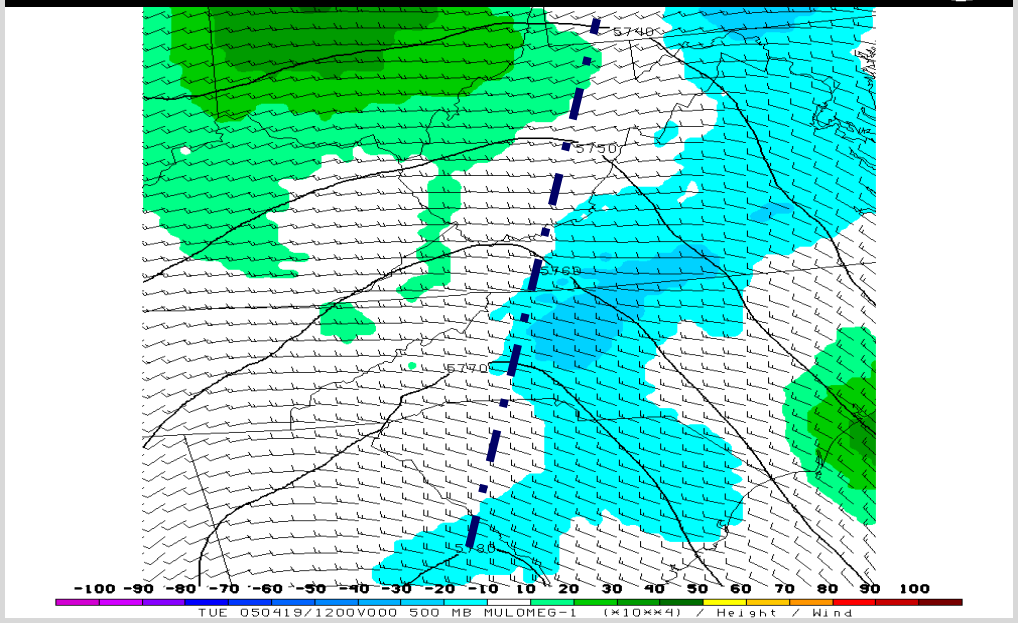
2005 Peak Ozone: April 19th

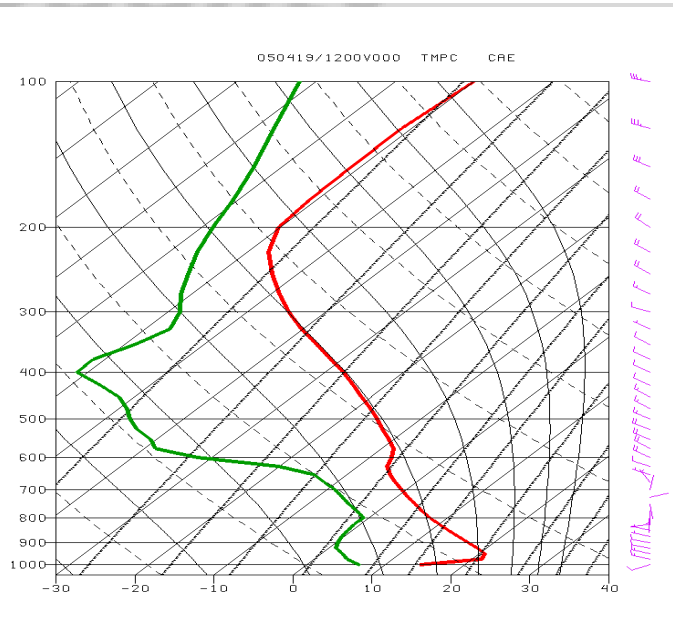
- Strong ridge of high pressure both at surface and aloft
- Light westerly wind transported precursors from the Atlanta area
- Very dry atmosphere & low soil moisture content
- High residual O_3 and precursors

April 19, 2005 Weather Data

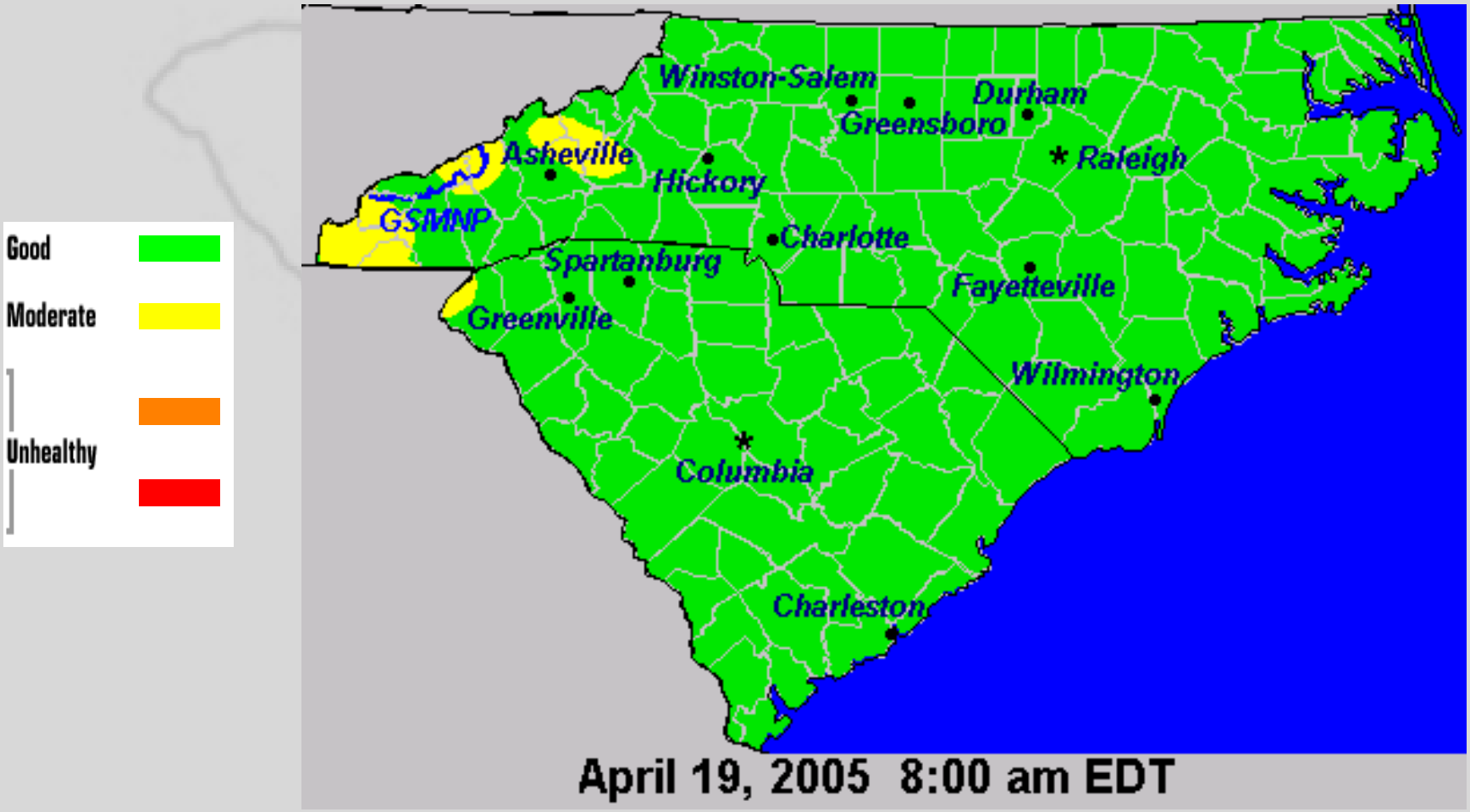








EPA AirNOW 8-hr Summary Loop: April 19, 2005



Your Turn !!
Forecast Exercise - Midlands

Forecast Element	Case A	Case B
Pattern	Hi pres over SC	Hi pres ovr Bermuda
Sky Cover	Sunny	Partly Cloudy
Max Temperature (F)	100	85
Wind Speed (mph)	5	10
Wind Direction (from)	West	SE
Today's Ozone	mid-Yellow	mid-Yellow
Tomorrow's Ozone	Color ??	Color ??

(Hint: One is GREEN, one is ORANGE)

Forecast Exercise – Midlands Answer

Forecast Element	Case A	Case B
Pattern	Hi pres over SC	Hi pres ovr Bermuda
Sky Cover	Sunny	Partly Cloudy
Max Temperature (F)	100	87
Wind Speed (mph)	5	10
Wind Direction (from)	West	Southeast
Today's Ozone	mid-Yellow	mid-Yellow
Tomorrow's Ozone	ORANGE !	GREEN !


Questions?
Comments?
The BAQ Meteorology Support Team:
John Allard, Wes Behrend, Paul Martin
Greg Quina and Steve Smutz